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Vacuum Plane Waves: Equivalence and Physical Interpretation

In this talk I will give a brief summary of the Karlhede algorithm, and implement it for the gravitational plane wave spacetimes, as an illustrative example. This provides an invariant classification of these spacetimes in terms of a set of invariants - the so called Cartan invariants. By imposing conditions on the set of Cartan invariants one may reproduce known subclasses of these metrics. As a final point, I will show how the invariant structure relates to the physical interpretation of these spacetimes, by employing the geodesic deviation equations relative to timelike observers.